

39. The method for manufacturing polyhydroxyalkanoate according to claim 37, wherein said saccharide is any of selected from the group consisting of glyceroaldehyde, erythrose, arabinose, xylose, glucose, galactose, mannose, fluctose, glycerol, erythritol, xylitol, gluconic acid, glucuronic acid, galacturonic acid, maltose, sucrose and lactose.

40. The method for manufacturing polyhydroxyalkanoate according to claim 1, wherein the number average molecular weight of said polyhydroxy alkanoate is 5000 to 1000000.

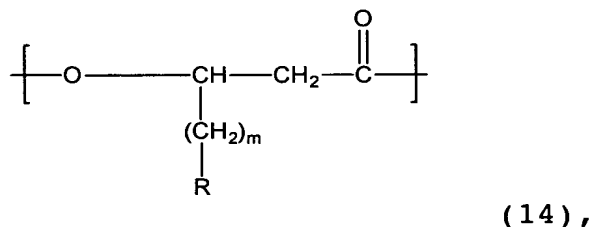
WHAT IS CLAIMED IS:

1. A method for manufacturing polyhydroxyalkanoate, comprising the steps of:

providing at least one selected from the group consisting of substituted alkanes represented by the following general formula (13):

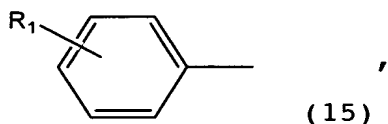


wherein R is a residue including a substituted aromatic ring, and n is any integer selected from 0 to 9; and producing polyhydroxyalkanoate comprising at least one selected from 3-hydroxy-substituted alkanoate units represented by the following general formula (14) in the molecule:

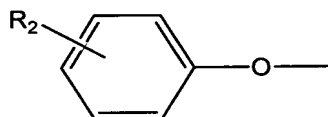


wherein R is a residue including a substituted aromatic ring; and m is any optional integer selected from 0 to 9.

2. The method for manufacturing polyhydroxyalkanoate according to claim 1, wherein R in general formulas (13) and (14) is any one selected from the group consisting of substituted phenyl residues represented by the chemical formula (15):

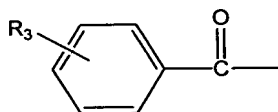


wherein R_1 is any one selected from the group consisting of $-H$, $-CN$, $-NO_2$, halogen, $-CH_3$, $-C_2H_5$, $-C_3H_7$, $-CH_2=CH$, $-CF_3$, $-C_2F_5$ and $-C_3F_7$, substituted phenoxy residues represented by the chemical formula (16):



(16),

wherein R_2 is any one selected from the group consisting of $-H$, $-CN$, $-NO_2$, halogen, $-CH_3$, $-C_2H_5$, $-C_3H_7$, $-CH_2=CH$, $-CF_3$, $-C_2F_5$ and $-C_3F_7$, and substituted benzoyl residues represented by the chemical formula (17):



(17),

wherein R_3 is any one selected from the group consisting of $-H$, $-CN$, $-NO_2$, halogen, $-CH_3$, $-C_2H_5$, $-C_3H_7$, $-CH_2=CH$, $-CF_3$, $-C_2F_5$ and $-C_3F_7$.

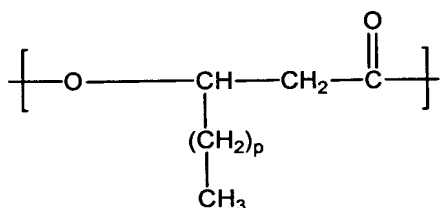
3. The method for manufacturing polyhydroxyalkanoate according to claim 1, wherein said producing step is carried out in the presence of a microorganism capable of producing said polyhydroxyalkanoate using at least one selected from the group consisting of said substituted alkanes as a starting compound.

4. The method for manufacturing polyhydroxyalkanoate according to claim 3, wherein relationship between n in general formula (13) and m in general formula (14) is represented by the following equation (1):

$$m=n-2l \quad (1)$$

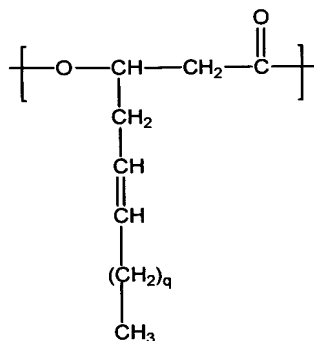
wherein l is any integer of $0 \leq l < (1/2)n$.

5. The method for manufacturing polyhydroxyalkanoate according to claim 3, wherein said polyhydroxyalkanoate further comprises at least one selected from the group consisting of 3-hydroxy-alkanoic acid units represented by the following general formula (18):



(18),

wherein p is any integer selected from 0 to 8, which can have one or more values in the polymer, and 3-hydroxy-alka-5-enoic acid units represented by the following general formula (19):



(19),

wherein q is any integer selected from 3 to 5, which can have one or more values in the polymer.

6. The method for manufacturing polyhydroxyalkanoate according to claim 3, comprising the step of culturing said microorganism in a medium containing at least one selected from the group consisting of said substituted alkanes.

7. The method for manufacturing polyhydroxyalkanoate according to claim 6, further comprising the step of culturing said microorganism in a medium containing dicyclopropylketone.

8. The method for manufacturing polyhydroxyalkanoate according to claim 7, wherein said culturing step is comprised of the steps of:

(step 1-1) culturing said microorganism in the medium further containing dicyclopropylketone and polypeptone, and subsequently

(step 1-2) culturing the microorganism cultured in said step 1-1 in a medium containing said substituted alkane and an organic acid or its salt.

9. The method for manufacturing polyhydroxyalkanoate according to claim 8, said medium used in said step 1-2 further containing dicyclopropylketone.

10. The method for manufacturing polyhydroxyalkanoate according to claim 8, said medium used in said step 1-1 further containing said substituted alkane.

11. The method for manufacturing polyhydroxyalkanoate according to claim 8, wherein said saccharide is any of selected from the group consisting of glyceroaldehyde, erythrose, arabinose, xylose, glucose, galactose, mannose, fructose, glycerol, erythritol, xylitol, gluconic acid, glucuronic acid, galacturonic acid, maltose, sucrose and lactose.

12. The method for manufacturing polyhydroxyalkanoate according to claim 7, wherein said culturing step is comprised of the steps of:

(step 1-3) culturing said microorganism in the medium further containing dicyclopropylketone and saccharide, and subsequently

(step 1-4) culturing the microorganism cultured in said step 1-3 in a medium containing said substituted alkane and a saccharide.

13. The method for manufacturing polyhydroxyalkanoate according to claim 12, said medium used in said step 1-4 further containing dicyclopropylketone.

14. The method for manufacturing polyhydroxyalkanoate according to claim 12, said medium used in said step 1-3 further containing said substituted alkane.

15. The method for manufacturing polyhydroxyalkanoate according to claim 12, wherein said saccharide is any of selected from the group consisting of glyceroaldehyde, erythrose, arabinose, xylose, glucose, galactose, mannose, fluctose, glycerol, erythritol, xylitol, gluconic acid, glucuronic acid, galacturonic acid, maltose, sucrose and lactose.

16. The method for manufacturing polyhydroxyalkanoate according to claim 7, wherein said culturing step is comprised of the steps of:

(step 1-5) culturing said microorganism in the medium further containing dicyclopropylketone and polypeptone, and subsequently

(step 1-6) culturing the microorganism cultured in said step 1-5 in a medium containing said substituted alkane and a saccharide.

17. The method for manufacturing polyhydroxyalkanoate according to claim 16, said medium used in said step 1-6 further containing dicyclopropylketone.

18. The method for manufacturing polyhydroxyalkanoate according to claim 16, said medium used in said step 1-5 further containing said substituted alkane.

19. The method for manufacturing polyhydroxyalkanoate according to claim 16, wherein said saccharide is any of selected from the group consisting of glyceroaldehyde, erythrose, arabinose, xylose, glucose, galactose, mannose, fructose, glycerol, erythritol, xylitol, gluconic acid, glucuronic acid, galacturonic acid, maltose, sucrose and lactose.

20. The method for manufacturing polyhydroxyalkanoate according to claim 6, wherein said medium contains polypeptone.

21. The method for manufacturing polyhydroxyalkanoate according to claim 6, wherein said medium contains yeast extract.

22. The method for manufacturing polyhydroxyalkanoate according to claim 6, wherein said medium contains a saccharide.

23. The method for manufacturing polyhydroxyalkanoate according to claim 22, wherein said saccharide is any one selected from the group consisting of glyceroaldehyde, erythrose, arabinose, xylose, glucose, galactose, mannose, fructose, glycerol, erythritol, xylitol, gluconic acid, glucuronic acid, galacturonic acid, maltose, sucrose and lactose.

24. The method for manufacturing polyhydroxyalkanoate according to claim 6, wherein said medium contains an organic acid or its salt.

25. The method for manufacturing polyhydroxyalkanoate according to claim 24, wherein said organic acid or its salt is any one selected from the group consisting of pyruvic acid, malic acid, lactic acid, citric acid, succinic acid and their salts.

26. The method for manufacturing polyhydroxyalkanoate according to claim 6, wherein said medium contains an amino acid or its salt.

27. The method for manufacturing polyhydroxyalkanoate according to claim 26, wherein said amino acid or its salt is any one selected from the group consisting of glutamic acid, aspartic acid, and their salts.

28. The method for manufacturing polyhydroxyalkanoate according to claim 6, wherein said medium contains a straight chain alkanolic acid having 4 to 12 carbons or its salt.

29. The method for manufacturing polyhydroxyalkanoate according to claim 6, wherein said culturing step is comprised of the steps of:

(step 1-1) culturing said microorganism in the medium further containing polypeptone, and subsequently

(step 1-2) culturing the microorganism cultured in said step 1-1 in a medium containing said substituted alkane and an organic acid or its salt.

30. The method for manufacturing polyhydroxyalkanoate according to claim 29, wherein said organic acid or its salt is any one selected from the group consisting of pyruvic acid, malic acid, lactic acid, citric acid, succinic acid, and their salts.

31. The method for manufacturing polyhydroxyalkanoate according to claim 30, said medium used in said step 1-2 containing dicyclopropylketone.

32. The method for manufacturing polyhydroxyalkanoate according to claim 6, wherein said culturing step is comprised of the steps of:

(step 1-3) culturing said microorganism in the medium further containing a saccharide, and subsequently

(step 1-4) culturing the microorganism cultured in said step 1-3 in a medium containing said substituted alkane and a saccharide.

33. The method for manufacturing polyhydroxyalkanoate according to claim 6, wherein said culturing step is comprised of the steps of:

(step 1-5) culturing said microorganism in the medium further containing polypeptone and said substituted alkane, and subsequently

(step 1-6) culturing the microorganism cultured in said step 1-5 in a medium containing said substituted alkane and a saccharide.

34. The method for manufacturing polyhydroxyalkanoate according to claim 33, said medium used in said step 1-6 containing dicyclopropylketone.

35. The method for manufacturing polyhydroxyalkanoate according to claim 33, wherein said saccharide is any of selected from the group consisting of glyceroaldehyde, erythrose, arabinose, xylose, glucose, galactose, mannose, fructose, glycerol, erythritol, xylitol, gluconic acid, glucuronic acid, galacturonic acid, maltose, sucrose and lactose.

36. The method for manufacturing polyhydroxyalkanoate according to claim 3, wherein said microorganism is a microorganism having alkane monooxygenase.

37. The method for manufacturing polyhydroxyalkanoate according to claim 36, wherein said microorganism is *Pseudomonas cichorii* YN2 (FERM BP-7375).

38. The method for manufacturing polyhydroxyalkanoate according to claim 37, said medium used in said step 1-4 containing dicyclopropylketone.